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THE AWARD OF THE BRUCE MEDAL TO DR. J. O. BACKLUND.

By ALEXANDER MCADIE.

In accordance with the vote of the Directors, acting on the recommendations of the nominating astronomers at home and abroad, it becomes the pleasant duty of the retiring President to announce the award of the Bruce Gold Medal of the Society to Dr. JOHANN OSKAR BACKLUND, Director of the Russian Royal Observatory, at Pulkowa. Dr. BACKLUND is the eleventh recipient of the medal, and it is of interest to know that he makes the list of medalists more truly international in character, representing in himself both Sweden and Russia. Germany, Great Britain, Italy, France, Holland, and the United States are already represented, and South Africa, if we credit Sir DAVID GILL to the Cape of Good Hope. Like many distinguished American astronomers, BACKLUND has exacting administrative duties, due to his position as Director of a large observatory. He does not represent what might be called the popular type of astronomer, but rather the painstaking, thoroly patient investigator, content to take some difficult problem and give, if necessary, a life-time to the solution.

A professional astronomer alone can do justice to BACKLUND's work; and your President, not being such, has felt it wise to rely upon the kind assistance of a former recipient of the Bruce Medal, Professor E. C. PICKERING.

BACKLUND's chief research work has been in connection with the determination of the motion and brightness of Encke's Comet, the earliest discovered short-period comet and one that, with the exception of Halley's Comet (a long-period comet), has been more closely studied than any other. First seen in 1786 by MÉCHAIN and MESSIER, the comet was rediscovered by Miss CAROLINE HERSCHEL in 1795. In 1805 PONS, HUTH and BOUVARD saw it on the same day. In 1818 PONS rediscovered it, and in 1819 ENCKE showed that it moved in an elliptic orbit with approximately a three-year period. By 1820 he was able to show that the period was diminishing.

To quote from Professor NEWALL[1]:—

> "In BODE'S *Jahrbuch* for 1826 (May, 1823) comes ENCKE'S first serious consideration of a resisting medium, which NEWTON had never discountenanced and which LAPLACE and EULER had not succeeded in demonstrating. ENCKE there quotes from a letter of OLBERS, written in answer to his inquiries, a passage relating to the possible comparability of the density of the comet and the density of the material of the zodiacal light; and thus, whereas the earlier papers of ENCKE have titles which refer to PON'S comet—a name which he always adhered to, in spite of the remonstrances of BODE and many others—the title of his last (1858) summary of work on the subject (*Berl. Jahrbuch,* 1861, abstracted in English in *M. N.,* xix, 70-75) is 'On the existence of a resisting medium in space.'"

The comet reappeared in 1822, 1825, and 1828, its perihelion passages being calculated in advance on the basis of the existence of a resisting medium. The assumptions were that the resistance of the medium was proportional to its density and the square of the velocity of the comet; also that the density of the medium varies inversely as the square of the distance from the Sun. The action of the medium on the comet was represented by a tangential force given in a certain equation. In brief, the argument was that the motion of Encke's Comet, especially the gradual increase in the mean motion, could be accounted for on the assumptions made above. The argument, however, was not satisfactory in connection with planetary perturbations. After ENCKE'S death the problem was carried further by von ASTEN and Dr. E. BECKER. Von ASTEN went to Pulkowa in 1870 and continued the investigation of the theory of the motion of Encke's Comet on the basis of absolute perturbations.

Von ASTEN died in 1878, and from that time unto the present Dr. BACKLUND has continued the work. Finding that the apparitions of 1871-1881 contradicted previous hypotheses and rather suggested that the constant of resistance had changed, BACKLUND determined to calculate afresh the whole series of perturbations from 1819. Thru the support of the Academy of Sciences of St. Petersburg and the generosity of M. E. NOBEL he published in six volumes the perturbations of the orbit due to the planets *Mercury, Venus,* Earth, *Mars, Jupiter,* and *Saturn* from 1819 to 1891, embracing twenty-two revolutions and twenty-three apparitions of the comet. The first result was that with regard to acceleration, the twenty-three apparitions could not be connected as a whole; and the period was therefore divided into three parts: 1819-1858, 1858-1871, 1871-1891. The main results in brief are that the acceleration was on an average constant during 1819-1858, diminished in 1858 and in 1868, and was again constant in 1871-1891. In addition to these changes, a well-established periodic change occurs at least in the interval 1819-1858. Further, the mass of *Mercury* appears to be well determined. The value 1/9,700,000 must be considered as a close approximation to the truth; and the mass of *Venus* is possibly less than the assumed value 1/401,839.

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[1] *Monthly Notices R. A. S.,* **69**, 324, 1909.

To quote again from Professor NEWALL:—

> "Dr. BACKLUND has considered the hypothesis that the comet crosses a meteoric ring in the neighborhood of the perihelion; but he rejects it as improbable in many respects, and as incapable of explaining many particulars. He points out that the greatest outstanding errors occur in the perihelion passages in 1828, 1838, 1848, which were years of great sun-spot activity. About 1858 the first abrupt change in the acceleration took place, and 1860.1 is registered as a year of maximum solar activity. The change in 1868 is not far from the maximum of 1870; and lastly, the well-determined abrupt change of 1895 is close to the maximum in 1894. It seems that these coincidences can hardly be mere chance. But Dr. BACKLUND regards his task as completed when astrometry in his hands has been made to deliver up all the facts at present attainable with respect to the kinematics of the comet. We can well imagine with what satisfaction Dr. BACKLUND views the disappearance of the long-outstanding difficulty with regard to the derived mass of *Mercury,* the constancy of which offered such a splendid guarantee for the accuracy and trustworthiness of the whole investigation.

While his work on Encke's Comet has been his chief investigation, a work which by itself won the award of the Gold Medal of the Royal Astronomical Society in 1909, BACKLUND has made many other notable contributions to theoretical astronomy. Among these may be mentioned his investigation on the motion of minor planets of the *Hecuba* type, carried on along the lines laid out by GYLDÉN; a defense of GYLDÉN's method against attacks by other theoretical astronomers; and a valuable investigation of the Theory of Precession and Nutation, in which he succeeded in a development, where LAPLACE, STOCKWELL, and ADAMS had failed. In this the long-period periodic planetary terms caused trouble. LAPLACE and the others failed because they sought to find the general solution, retaining the long-period periodic terms, and wishing to derive the planetary terms through ordinary quadratures. BACKLUND, on the other hand, succeeded by not separating them from the nutation terms, but by deriving them in the same way as the long-period elementary terms in his treatise "Ueber die Bewegung kleiner Planeten vom Hecubatypus."

In closing, I wish to mention some of the other honors that have been conferred upon our medallist. In addition to the award of the Gold Medal of the Royal Astronomical Society, to which reference has been made, he was honored by Cambridge University in 1904, when he was awarded its "Doctor in Science" *honoris causa*. Four other eminent scientists—namely, DAVID GILL, NORMAN LOCKYER, WILLIAM RAMSAY, and ARTHUR SCHUSTER—were given the same degree by Cambridge at this time. In 1905 the honorary Doctorate was conferred by the University of Kapstadt upon BACKLUND and G. H. DARWIN, DAVID GILL, and J. C. KAPTEYN.

THE GREAT AND THE SMALL—PRESIDENTIAL ADDRESS.

BY ALEXANDER MCADIE.

Members of the Astronomical Society of the Pacific:

By a wise unwritten law of this Society, a layman is elected President every alternate year. In the present instance, the wisdom of the custom is not so readily apparent, and your President, conscious of short-comings even in the modest role of layman, tried his best to escape the honor which his fellow directors saw fit to offer. As a layman, however, it has been his rare privilege to know well many astronomers, and because of their patience and forbearance he has absorbed certain information which leads him to believe that astronomy, pre-